

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. PCT/ SE 96 / 00299

International Filing Date 07 -03- 1996

**The Swedish Patent Office
PCT International Application**

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 819/1030

Box No. I TITLE OF INVENTION

Method and arrangement in a radio communication system

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

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☐ all designated
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☒ all designated States except
the United States of America

☐ the United States
of America only

☐ the States indicated in
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☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

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Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet is not to be included in the request.

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This person is:

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☐ applicant and inventor
☐ inventor only *(If this check-box is marked, do not fill in below.)*

State (i.e. country) of nationality:

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Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

This person is:

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☐ inventor only *(If this check-box is marked, do not fill in below.)*

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Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

This person is:

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State (i.e. country) of nationality:

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Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes: at least one must be marked):

Regional Patent

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In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM

Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) Sweden	31.03.95 31 March 1995	9501177-1	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): 9501177-1

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / SE

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request.

Country (or regional Office):

Date (day/month/year):

Number:

Sweden

31.03.1995

SE95/00335

Box No. VIII CHECK LIST

This international application contains the following number of sheets:

1. request : 4 sheets ✓
 2. description : 6 sheets ✓
 3. claims : 3 sheets ✓
 4. abstract : 1 sheets ✓
 5. drawings : 2 sheets ✓
 Total : 16 sheets ✓

This international application is accompanied by the item(s) marked below:

1. ☐ separate signed power of attorney
 2. ☐ copy of general power of attorney
 3. ☐ statement explaining lack of signature
 4. ☐ priority document(s) identified in Box No. VI as item(s):
 5. ☐ fee calculation sheet
 6. ☐ separate indications concerning deposited microorganisms
 7. ☐ nucleotide and/or amino acid sequence listing (diskette)
 8. ☒ other (specify): International-Type Search Report

Figure No. 2 of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

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Lars Billström

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1. Date of actual receipt of the purported international application:

07 -03- 1996

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority specified by the applicant:

ISA / SE

6. ☐ Transmittal of search copy delayed until search fee is paid

2. Drawings:

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Date of receipt of the record copy by the International Bureau:

26 APRIL 1996 (26.04.96)

Förfarande och anordning i ett radiokommunikationssystem

TEKNISKT OMRÅDE

Föreliggande uppfinning avser ett förfarande vid ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data enligt ett meddelandesynkront ALOHA-protokoll med reservation. Uppfinningen avser ett förfarande vid accessbegäran i ett momentant överbelastat, mobilt radiosystem, varvid en i en basstation mottagen accessbegäran från var och en i en första grupp mobila stationer ej kan besvaras genom kanalreservation för den första gruppen mobila stationer.

Uppfinningen avser även en basstation och en mobil station i ett radiokommunikationssystem för paketöverföring av data.

TEKNIKENS STÅNDPUNKT

Vid mobila radiokommunikationssystem för paketöverföring av data kan en basstation kommunicera med ett flertal mobila stationer via en eller flera tidsdelade kanaler mellan basstationen och de mobila stationerna. En tidsdelad kanal är indelad i tidluckor. I varje tidlucka kan en dataskur med ett antal informationsbitar överföras. De mobila stationerna kommunicerar inte kontinuerligt med basstationen och ett flertal mobila stationer kan därför tävla om en och samma tidsdelade kanal. Kanaltilldelning sker dynamiskt utifrån mobilstationernas kanalbehov och styrs av basstationen.

En mobil station meddelar ett kanalbehov genom att sända en accessbegäran till basstationen. Denna accessbegäran sänds i en reservationsfas i den tidsdelade kanalen för sändning från de mobila stationerna till basstationen. För att kontrollera accessbegäran och kanaltilldelning kan olika typer av protokoll utnyttjas. Ett vanligt protokoll vid dynamisk tilldelning av tidsdelade radiokanaler är ett meddelandesynkront ALOHA-protokoll med reservation. Vid detta protokoll föregås varje paketöverföring av en reservation. Ett kort meddelande med en begäran om kanalreservation sänds slumpmässigt från en mobil station till en basstation. Enligt ALOHA-reservationsprotokollet återkopplas resultatet av denna accessbegäran genom att basstationen ger mobilstationen tillgång till åtminstone en del av den tidsdelade kanalen.

Eftersom flera mobilstationer kan ha ett behov av paketöverföring av data, kan kollision inträffa genom att flera mobila stationer samtidigt sänder accessbegäran.

Detta medför att av de samtidigt sända meddelandena kan basstationen i bästa fall mottaga ett meddelande (med utnyttjande av s k "capture"-effekt). Vid kollision måste de sändande mobilstationerna som ej erhåller kanalreservation upprepa sin accessbegäran. För att minska risken för ny kollision, sker den upprepade sändningen efter ett viss tidsintervall som varierar för varje mobil station. Det är väl känt att låta detta tidsintervall variera slumpmässigt för respektive mobilstation.

Då all ledig kanalkapacitet i ett radiokommunikationssystem är reserverad för kommunikation uppstår överbelastning då ytterligare en mobil station sänder accessbegäran till basstationen. Denna mottar i och för sig accessbegäran från den mobila stationen, men kan inte tillmötesgå denna begäran inom ett visst förutbestämt tidsintervall på grund av att ledig kanalkapacitet saknas. Mobilstationen tvingas då upprepa accessbegäran på samma sätt som vid kollision, efter det att det förutbestämda tidsintervallet har passerat. Detta leder naturligtvis till onödig extra kanalbelastning, onödiga fördröjningar i mobilsystemet samt risk för att kollision uppstår vid den upprepade sändningen.

Genom exempelvis US, A, 5 166 929 är förut känt ett fleraccessprotokoll, vid vilket en återkoppling sker från basstationen till de mobila stationerna beträffande status för en accesskanal. De mobila stationerna kan därigenom erhålla information beträffande utgången av en accessbegäran, exempelvis att kollision har inträffat samt om nästa tidlucka är öppen för sändning av ny accessbegäran. Denna information gör det möjligt att bättre bestämma när ny accessbegäran bör sändas. En nackdel med detta protokoll är att en överbelastningssituation ej kan hanteras. En i basstationen mottagen accessbegäran måste upprepas i en situation då kanaltilldelning tillfälligtvis inte kan utföras i basstationen på grund av överbelastning, dvs att lediga kanaler saknas.

I ett bidrag "Medium Access Priority" av Motorola till ett standardiseringsmöte inom ETSI STC SMG2 i Edinburgh den 7 mars 1995, diskuteras ett eventuellt behov av mottagningsbekräftelse vid accessbegäran från en mobilstation till en basstation. Mobilstationen skulle därigenom informeras om att accessbegäran har blivit korrekt mottagen i basstationen. Hur denna bekräftelse av accessbegäran ska utföras anges dock ej.

REDOGÖRELSE FÖR UPPFINNINGEN

Föreliggande uppfinning avser att tillhandahålla ett förfarande i ett radiokommu-

nikationssystem för paketöverföring av data. Uppfinningen löser problemet med att hantera accessbegäran från var och en i en första grupp mobila stationer till en basstation i ett momentant överbelastat radiokommunikationssystem, vilket saknar ledig kanalkapacitet för dataöverföring.

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Problemet löses vid användning av ett meddelandesynkront ALOHA-protokoll med reservation. Paketöverföring av data utförs via en eller flera tidsdelade kanaler mellan en basstation och mobila stationer. De mobila stationerna är inrättade att sända accessbegäran till basstationen vid en reservationsfas i ett mobilt radiosystem, vilket utnyttjar detta protokoll. Basstationen är inrättad att mottaga och tillmötesgå accessbegäran från en första mobil station genom att sända ett kanalreservationsmeddelande innefattande en kanalreservation till denna. Genom denna kanalreservation reserveras tidluckor för paketöverföring av data från den första mobila stationen till basstationen. Basstationen är vidare inrättad att mottaga accessbegäran från en första grupp mobila stationer till vilka kanalreservation momentant ej kan utföras. I enlighet med det uppfinningsenliga förfarandet bekräftas mottagen accessbegäran från den första gruppen av mobila stationer då kanalreservation ej kan utföras på vanligt sätt. Bekräftelse sänds i form av accessbekräftelser som inkluderas i samma kanalreservationsmeddelande som nämnda kanalreservation till den första mobila stationen. Kanalreservationsmeddelandet mottages av var och en av de mobila stationerna i nämnda första grupp. De mobila stationerna påverkas att invänta kanalreservation utan upprepad accessbegäran. I samband med accessbekräftelserna ordnas en kö i det mobila radiosystemet av de mobila stationerna i denna första grupp. Kanalreservation utförs för de mobila stationerna i den första gruppen i enlighet med deras position i denna kö.

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Uppfinningen avser även en basstation respektive en mobil station i ett radiokommunikationssystem för paketöverföring av data. Den uppfinningsenliga basstationen respektive mobila stationen är inrättad att utnyttja det uppfinningsenliga förfarandet.

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Genom det uppfinningsenliga förfarandet kan belastningen på en accesskanal till basstationen minskas eftersom det antal tillfällen som en accessbegäran upprepas i systemet minskas. Detta minskar naturligtvis den genomsnittliga fördröjningen vid överföring av data mellan en mobil station och en basstation. Vidare kan ett kortare tidsintervall förutbestämmas innan accessbegäran åter initieras, vilket medför kortare genomsnittlig accessfördröjning.

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FIGURBESKRIVNING

Figur 1 visar ett mobilt radiosystem med mobila stationer och en basstation.

Figur 2 visar ett kanalreservationsmeddelande från en basstation till mobila stationer.

FÖREDRAGEN UTFÖRINGSFORM

Uppfinningen kommer i det följande att förklaras närmare med hänvisning till figurerna, på vilka figur 1 visar en cell 1 i ett mobilt radiokommunikationssystem med mobila stationer MS1-MS3 och en basstation BS, exempelvis ett GSM-system för kommunikation via tidsmultiplexkanaler (TDMA).

I den föredragna utföringsformen utnyttjas en enda kommunikationskanal Ch1, vilken är anpassad för överföring av datapaket. Detta innebär att såväl paketöverföringen som överföring av tillhörande kontrollsignaler sker via samma kanal.

En mobil station MS1 initierar en paketöverföring genom att sända en accessbegäran till en basstation BS via en kanal för datapaket. Denna accessbegäran innefattar en identifikation av den sändande mobila stationen, exempelvis i form av ett slumpstal, eventuellt tillsammans med information om önskad serviceklass (exempelvis prioritet). Accessbegäran skickas slumpmässigt för att minska risken att accessbegäran från ett flertal mobila stationer sänds samtidigt, men begäran måste sändas inom ett visst tidsintervall som är reserverat för denna typ av överföring. Detta tidsintervall kan exempelvis utgöras av en tidlucka i ett antal periodiskt återkommande tidsramar. Efter mottagen accessbegäran sänder basstationen BS, om kanalkapacitet finns tillgänglig för denna överföring av datapaket, ett kanalreservationsmeddelande 2 till den mobila stationen MS1. Detta kanalreservationsmeddelande inkluderar en kanalreservation varigenom tidluckor för överföring från den mobila stationen till basstationen tilldelas. Kanalreservationen innefattar vidare en hänvisning till den accessbegäran som accepterats. Hänvisningen inkluderar samma information som togs emot i accessbegäran och en referens till den tidsram eller tidlucka i den tidsdelade kanalen Ch1 i vilken accessbegäran togs emot. En mobil station MS1 erhåller därigenom information om att kanalreservationen är avsedd för just denna mobila station. Den mobila station MS1 från vilken accessbegäran härrör erhåller därigenom information att den har tilldelats tidluckor för paketöverföring av data.

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Under den tid som den mobila stationen MS1 utför paketöverföring av data på den reserverade kanalen, är det viktigt att övriga mobila stationer MS2,MS3 ej försöker initiera sändningar på kanalen. Accessbegäran från mobila stationer tillåts därför endast då basstationen BS anger att en eller flera tidluckor finns lediga för detta ändamål. Basstationen markerar möjlighet att sända accessbegäran genom en flagga på kanalen till de mobila stationerna MS1-MS3. Då en paketöverföring av data i tilldelade tidluckor har avslutats, markerar basstationen att ett antal tidluckor i kanalen från mobila stationer till basstation på nytt är öppna för accessbegäran. Ny slumpmässig accessbegäran kan då sändas till basstationen.

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Under de tidluckor som är lediga mellan överföring av olika datapaket från mobila stationer till basstationen, dvs öppna för accessbegäran, kan flera mobila stationer MS1-MS3 hinna sända en accessbegäran till basstationen BS. Om samtidig sändning inträffar för några av mobilstationerna MS1-MS3 uppstår kollision mellan sändningarna. Basstationen BS har vid denna kollisionssituation ej möjlighet att uppfatta meddelanden från mer än på sin höjd en av de berörda stationerna och sändning av accessbegäran måste därför upprepas.

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Om flera mobila stationer MS1-MS3 sänder accessbegäran utan överlappning till en basstation kan kanalreservation endast utföras för någon eller några av dessa stationer. Då kanalreservation utförs för en första mobil station MS1 måste övriga övriga mobila stationer MS2,MS3 invänta ledig kanalkapacitet trots att accessbegäran från dessa har mottagits på ett korrekt sätt i basstationen BS. I om-sändningssituationer kan slumpmässig accessbegäran även erhållas mellan olika överföringar som ingår i en sekvens som rör ett och samma datapaket. Detta beror på att det är önskvärt att utnyttja luckorna i en sådan sekvens för att kunna ta emot accessbegäran. För att hindra en ny våg av accessförfrågningar från dessa mobila stationer MS2,MS3, besvaras enligt uppfinningen normalt varje i basstationen korrekt mottagen accessbegäran (upp till en viss gräns). Accessbekaftelser 4,5 skickas alltså till åtminstone ett antal av de stationer MS2,MS3 som inte omedelbart får mottaga en kanalreservation 3. Dessa accessbekaftelser inkluderas i ett kanal-reservationsmeddelande 2 innefattande en kanalreservation 3 till den mobila station MS1 som tilldelas en kanal som svar på accessbegäran. Ett sådant kanalreservationsmeddelande 2 visas i figur 2. Genom att denna kanalreservation 3 sänds i ett meddelande 2 med ett för alla kontrollmeddelanden gemensamt format, exempelvis omfattande fyra tidluckor, och genom att viss kontrollinformation kan samutnyttjas, kan ett begränsat antal accessbekaftelser 4,5 inkluderas i samma meddelande 2.

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Dessa accessbekräftelser medför således ingen ökad kanalbelastning.

5 Bekräftelse av korrekt mottagen accessbegäran från ett antal mobila stationer gör det möjligt att ordna en kö i det mobila radiosystemet med mobila stationer som inväntar sin tur för paketöverföring av data.

10 Vid användning av paketöverföring av data i GSM-systemet kan ett begränsat antal accessbekräftelser inkluderas i ett meddelande med kanalreservation. Denna accessbekräftelse kan, vad gäller referensen till den tidsram då förfrågan från en mobilstation mottogs, implementeras på två sätt. Det ena sättet är att ange numret på tidsramen (relaterat till en viss multiramstruktur som används i systemet) på samma sätt som i kanalreservationen 3 i en del av kanalreservationsmeddelandet 2. Det andra sättet är att istället använda en referens relativt den tidsram som anges i det ordinarie kanalreservationsmeddelandet.

15 Uppfinningen är naturligtvis ej begränsad av ovan angivna utföringsform utan innefattar varje utförande som ligger inom skyddsomfånget för följande patentkrav.

PATENTKRAV

1. Förfarande vid ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data via åtminstone en tidsdelad kanal (Ch1) mellan en basstation (BS) och mobila stationer (MS1-MS3), enligt ett meddelandesynkront ALOHA-protokoll med reservation, varvid de mobila stationerna (MS1-MS3) är inrättade att sända
5 accessbegäran till basstationen (BS), vilken är inrättad att mottaga och tillmötesgå accessbegäran från åtminstone en första mobil station (MS1) genom att sända ett kanalreservationsmeddelande (2) innefattande en kanalreservation (3) till denna, varigenom tidluckor reserveras för paketöverföring av data mellan den första mobila stationen (MS1) och basstationen (BS), samt att mottaga accessbegäran från en
10 första grupp mobila stationer (MS2, MS3) till vilka kanalreservation momentant ej kan utföras, **kännetecknat av**,
- att mottagande av accessbegäran från den första gruppen av mobila stationer (MS2, MS3) bekräftas i form av en accessbekräftelse (4,5) från basstationen (BS) till var och en av de i den första gruppen ingående mobila stationerna (MS2, MS3);
 - 15 - att dessa accessbekräftelser (4,5) får ingå i kanalreservationsmeddelandet (2) med kanalreservationen (3) till den första mobila stationen (MS1);
 - att nämnda första grupp i radiokommunikationssystemet i samband med accessbekräftelserna ordnas i en kö, varvid en köposition tilldelas till var och en av de mobila stationerna i denna grupp; samt
 - 20 - att kanalreservation utförs för de mobila stationerna i enlighet med deras köposition.
2. Förfarande enligt patentkrav 1, **kännetecknat av**,
- att nämnda kanalreservationsmeddelande (2) avläses av alla de mobila stationer
25 från vilka accessbegäran mottages i basstationen; samt
 - att i detta kanalreservationsmeddelande (2) inkluderade accessbekräftelser (4,5) mottages i de mobila stationerna (MS2,MS3), varigenom dessa påverkas att invänta kanalreservation utan upprepad accessbegäran.
3. Förfarande enligt något av föregående patentkrav, **kännetecknat av**,
- 30 - att en första referens tillhandahålls i kanalreservationen (3) till den första mobila stationen, vilken första referens ger en hänvisning till en första tidlucka i den tidsdelade kanalen (Ch1), i vilken första tidlucka accessbegäran från den första mobila stationen (MS1) mottogs i basstationen (BS), samt
 - 35 - att en andra referens tillhandahålls i varje accessbekräftelse (4,5), vilken andra

referens ger en hänvisning till en andra tidlucka i den tidsdelade kanalen (Ch1), i vilken andra tidlucka accessbegäran mottogs i basstationen (BS) från respektive mobila station (MS2;MS3) till vilken accessbekräftelsen är ämnad.

- 5 4. Förfarande enligt patentkrav 3, **kännetecknat av**,
- att den andra referensen utgörs av det antal tidluckor som skiljer mellan nämnda första tidlucka och nämnda andra tidlucka.
- 10 5. Förfarande vid en basstation i ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data, via åtminstone en tidsdelad kanal, mellan en basstation och mobila stationer, enligt ett meddelandesynkront ALOHA-protokoll med reservation innefattande stegen:
- att mottaga accessbegäran från de mobila stationerna,
 - att tillmötesgå accessbegäran från åtminstone en första mobil station genom att
15 sända en kanalreservation till denna, varigenom tidluckor reserveras för paketöverföring av data mellan den första mobila stationen och basstationen,
 - att till var och en i en första grupp mobila stationer ge accessbekräftelse på mottagande av accessbegäran från den första gruppen mobila stationer till vilka kanalreservation momentant ej kan utföras,
 - 20 - att medsända dessa accessbekräftelser i samma meddelande som nämnda kanalreservation till den första mobila stationen,
 - att i samband med accessbekräftelserna, i radiokommunikationssystemet ordna en kö av de mobila stationerna i nämnda första grupp, varvid en köposition tilldelas respektive mobil station; samt
 - 25 - att utföra kanalreservation för de mobila stationerna i enlighet med deras köposition.
- 30 6. Basstation i ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data via åtminstone en tidsdelad kanal (Ch1) mellan basstationen (BS) och mobila stationer (MS1-MS3), enligt ett meddelandesynkront ALOHA-protokoll med reservation, varvid de mobila stationerna (MS1-MS3) är inrättade att sända accessbegäran till basstationen (BS), vilken är inrättad att mottaga och tillmötesgå accessbegäran från åtminstone en första mobil station (MS1) genom att sända ett kanalreservationsmeddelande (2) innefattande en kanalreservation (3) till
35 denna, varigenom ett antal tidluckor reserveras för paketöverföring av data mellan den första mobila stationen (MS1) och basstationen (BS), samt att mottaga accessbegäran från en första grupp mobila stationer (MS2,MS3) till vilka kanal-

reservation momentant ej kan utföras, **kännetecknad av,**

- att basstationen (BS) är inrättad att ge accessbekräftelse (4,5) till var och en av de i den första gruppen ingående mobila stationerna (MS2, MS3), från vilka accessbegäran mottagits;

5 - att basstationen (BS) är inrättad att inkludera dessa accessbekräftelser i samma kanalreservationsmeddelande (2) som nämnda kanalreservation (3) till den första mobila stationen (MS1);

10 - att basstationen (BS) är inrättad att ordna en kö av de mobila stationerna (MS2,MS3) i den första gruppen, varvid en köposition tilldelas till respektive mobil station; samt

- att basstationen är inrättad att utföra kanalreservation för de mobila stationerna i den första gruppen i enlighet med deras köposition.

15 7. Mobil station i ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data via åtminstone en tidsdelad kanal (Ch1) mellan basstationen (BS) och mobila stationer (MS1-MS3), enligt ett meddelandesynkront ALOHA-protokoll med reservation, varvid de mobila stationerna är inrättade att sända accessbegäran till basstationen, vilken är inrättad att mottaga och tillmötesgå accessbegäran från åtminstone en första mobil station (MS1) genom att sända ett

20 kanalreservationsmeddelande (2) innefattande en kanalreservation (3) till denna, varigenom tidluckor reserveras för paketöverföring av data mellan den första mobila stationen (MS1) och basstationen (BS), samt att mottaga accessbegäran från åtminstone en andra mobil station (MS2) till vilken kanalreservation tillfälligtvis ej kan utföras, **kännetecknad av,**

25 - att en mobil station (MS2) som har sänt accessbegäran till basstationen, är inrättad att avläsa varje kanalreservationsmeddelande (2) i den tidsdelade kanalen (Ch1); samt

30 - att nämnda mobila station (MS2) som har sänt accessbegäran till basstationen (BS) är inrättad att mottaga en accessbekräftelse (4) i nämnda kanalreservationsmeddelande (2) då kanalreservationen (3) ej avser denna mobila station (MS2), varefter den mobila stationen (MS2) är inrättad att invänta kanal-reservation utan att ytterligare accessbegäran sändes.

SAMMANDRAG

Föreliggande uppfinning avser ett förfarande vid ett radiokommunikationssystem, vilket är inrättat för paketöverföring av data enligt ett meddelandesynkront ALOHA-protokoll med reservation. Mobila stationer i systemet är inrättade att sända accessbegäran till en basstation vid en reservationsfas i ett mobilt radiosystem, vilket utnyttjar detta protokoll. Basstationen är inrättad att mottaga och tillmötesgå accessbegäran från en första mobil station genom att sända ett kanalreservationsmeddelande (2) innefattande en kanalreservation (3) till denna. Basstationen är vidare inrättad att mottaga accessbegäran från åtminstone en andra mobil station till vilken kanalreservation momentant ej kan utföras. I enlighet med det uppfinningsenliga förfarandet bekräftas en från den andra mobila stationen mottagen accessbegäran då kanalreservation ej kan utföras på vanligt sätt. Bekräftelsen sänds i form av en accessbekräftelse (4,5) som inkluderas i samma kanalreservationsmeddelande (2) som nämnda kanalreservation (3) till den första mobila stationen.

(fig 2)

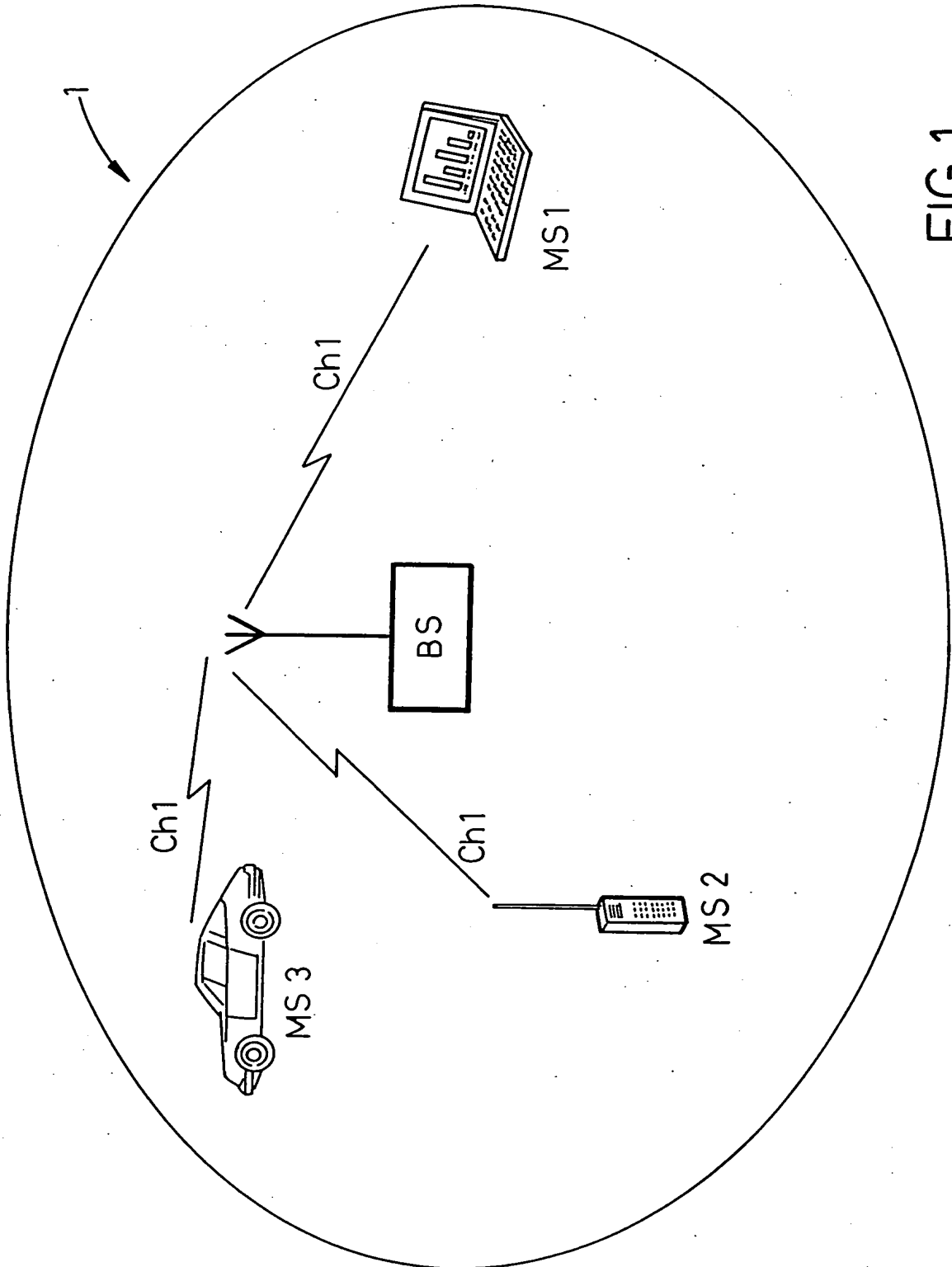


FIG. 1

07 -03- 1996

2/2

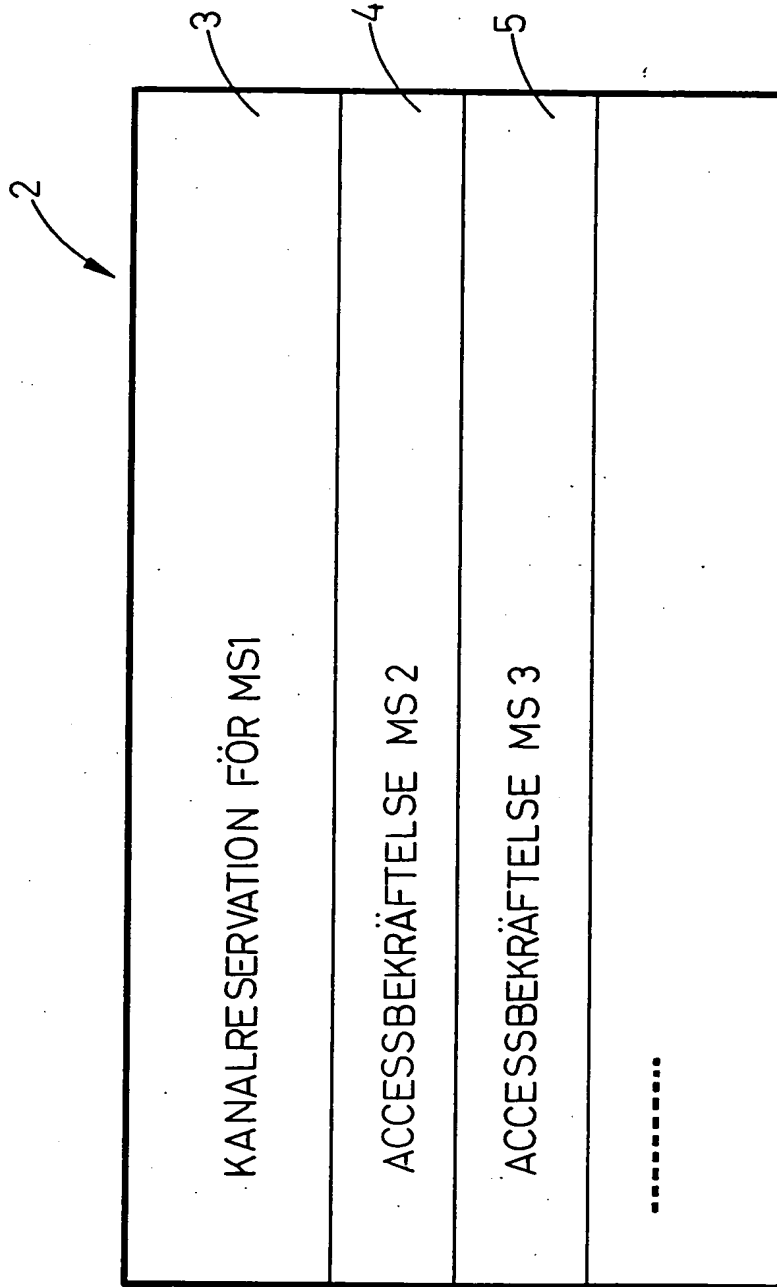


FIG. 2

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 21 October 1996 (21.10.96)	
International application No. PCT/SE96/00299	Applicant's or agent's file reference 819/1030
International filing date (day/month/year) 07 March 1996 (07.03.96)	Priority date (day/month/year) 31 March 1995 (31.03.95)
Applicant TURINA, Dalibor et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

03 October 1996 (03.10.96)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Ellen Moyse Telephone No.: (41-22) 730.91.11
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 819/1030	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE96/00299	International filing date (<i>day/month/year</i>) 07.03.1996	Priority date (<i>day/month/year</i>) 31.03.1995
International Patent Classification (IPC) or national classification and IPC ₆ H 04 Q 7/38		
Applicant Telefonaktiebolaget LM Ericsson et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 03.10.1996	Date of completion of this report 18.03.1997
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Henrik Fehninger Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

- ☒ the international application as originally filed.
- ☐ the description, pages _____, as originally filed,
 pages _____, filed with the demand,
 pages _____, filed with the letter of _____,
 pages _____, filed with the letter of _____.
- ☐ the claims, Nos. _____, as originally filed,
 Nos. _____, as amended under Article 19,
 Nos. _____, filed with the demand,
 Nos. _____, filed with the letter of _____,
 Nos. _____, filed with the letter of _____.
- ☐ the drawings, sheets/fig _____, as originally filed,
 sheets/fig _____, filed with the demand
 sheets/fig _____, filed with the letter of _____,
 sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-7</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-7</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-7</u>	YES
	Claims		NO

2. Citations and explanations

The invention according to claims 1-7 relates to a process for a radiocommunication system, which is arranged for packet data transmission according to an ALOHA protocol with reservation. The invention solves the problem with requesting access in a system which is momentarily overloaded. When the system is overloaded a base station cannot reserve a channel to all mobile stations, despite access requests sent from the mobile station. Collision occur as a result of many mobile stations sending access requests simultaneously, and in the best case at least the first mobile station receives an accept message. In the case of collision, the sending mobile stations, which are not receiving any channel reservation message, must repeat their access request. This leads to unnecessary channel loading and delays in the system, and further risks of collisions when transmissions are repeated. In the solution according to the invention access confirmation included in the same channel reservation message to the first mobile station is sent to those mobile stations

WO 9410767, A1, which is the best document, shows a method of effecting random access in a mobile radio system. A base station continuously transmits flags in part of the time slots of the control channels. When a mobile station wants to access the system, the base station transmits a first flag, and reserves one or more time slots to the mobile station. Furthermore, the base station transmits a flag which informs if a message word has been received or not. If the message word has not been received, the base station asks the mobile station to retransmit only the part of the message, which has not been received. This document discloses that a message will be completely transmitted to a base station without unnecessary repetition of message words that have been correctly received (See page 6, line 25 - page 7, line 27; abstract).

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V.

The invention stated in claims 1-7 differs from the document above in that first access confirmation is sent (a receipt) from the base station to the mobile station, and thereafter a queue of the mobile stations is arranged, so that channel reservation for the mobile stations is carried out according to their queue position.

Thus, the invention according to claims 1-7 is new, has industrial applicability and comprise an inventive step.

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

WILLQUIST, Bo
Albiñ Willquist AB
S:t Larsgatan 23
S-582 24 Linköping
SUEDE**ANKOM**
1996 -10- 15

Date of mailing (day/month/year) 03 October 1996 (03.10.96)		
Applicant's or agent's file reference 819/1030		
IMPORTANT NOTICE		
International application No. PCT/SE96/00299	International filing date (day/month/year) 07 March 1996 (07.03.96)	Priority date (day/month/year) 31 March 1995 (31.03.95)
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AT,AU,BR,CA,CN,CZ,DE,EP,FI,GB,JP,KP,KR,NO,NZ,PL,RO,RU,SK,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AL,AM,AP,AZ,BB,BG,BY,CH,DK,EA,EE,ES,GE,HU,IS,KE,KG,KZ,LK,LR,LS,LT,LU,LV,MD,MG,MK,
MN,MW,MX,OA,PT,SD,SE,SG,SI,TJ,TM,TR,TT,UA,UG,UZ,VN

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 03 October 1996 (03.10.96) under No. WO 96/31077

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 730.91.11
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 14 MAY 1997

WIPO

PCT

Applicant's or agent's file reference 819/1030	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE96/00299	International filing date (day/month/year) 07.03.1996	Priority date (day/month/year) 31.03.1995
International Patent Classification (IPC) or national classification and IPC ₆ H 04 Q 7/38		
Applicant Telefonaktiebolaget LM Ericsson et al		

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☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 03.10.1996	Date of completion of this report 18.03.1997
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Henrik Fehninger Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

I Basis of the report

1. This report has been drawn on the basis of (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.):

- ☒ the international application as originally filed.
- ☐ the description, pages _____, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____,
pages _____, filed with the letter of _____.
- ☐ the claims, Nos. _____, as originally filed,
Nos. _____, as amended under Article 19,
Nos. _____, filed with the demand,
Nos. _____, filed with the letter of _____,
Nos. _____, filed with the letter of _____.
- ☐ the drawings, sheets/fig _____, as originally filed,
sheets/fig _____, filed with the demand
sheets/fig _____, filed with the letter of _____,
sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-7</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-7</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-7</u>	YES
	Claims		NO

2. Citations and explanations

The invention according to claims 1-7 relates to a process for a radiocommunication system, which is arranged for packet data transmission according to an ALOHA protocol with reservation. The invention solves the problem with requesting access in a system which is momentarily overloaded. When the system is overloaded a base station cannot reserve a channel to all mobile stations, despite access requests sent from the mobile station. Collision occur as a result of many mobile stations sending access requests simultaneously, and in the best case at least the first mobile station receives an accept message. In the case of collision, the sending mobile stations, which are not receiving any channel reservation message, must repeat their access request. This leads to unnecessary channel loading and delays in the system, and further risks of collisions when transmissions are repeated. In the solution according to the invention access confirmation included in the same channel reservation message to the first mobile station is sent to those mobile stations

WO 9410767, A1, which is the best document, shows a method of effecting random access in a mobile radio system. A base station continuously transmits flags in part of the time slots of the control channels. When a mobile station wants to access the system, the base station transmits a first flag, and reserves one or more time slots to the mobile station. Furthermore, the base station transmits a flag which informs if a message word has been received or not. If the message word has not been received, the base station asks the mobile station to retransmit only the part of the message, which has not been received. This document discloses that a message will be completely transmitted to a base station without unnecessary repetition of message words that have been correctly received (See page 6, line 25 - page 7, line 27; abstract).

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE96/00299

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V.

The invention stated in claims 1-7 differs from the document above in that first access confirmation is sent (a receipt) from the base station to the mobile station, and thereafter a queue of the mobile stations is arranged, so that channel reservation for the mobile stations is carried out according to their queue position.

Thus, the invention according to claims 1-7 is new, has industrial applicability and comprise an inventive step.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00299

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9410767 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 11 May 1994 (11.05.94), page 6, line 25 - page 7, line 27, abstract --	1-7
A	GB 2281470 A (MOTOROLA LIMITED), 1 March 1995 (01.03.95), abstract --	1-7
A	Patent Abstracts of Japan, Vol 17, No 434, E-1412, abstract of JP, A, 50-91009 (NIPPON TELEGR & TELEPH CORP), 9 April 1993 (09.04.93), see abstract --	1-7

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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Date of the actual completion of the international search

30 May 1996

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Date of mailing of the international search report

17 -07- 1996

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00299

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5166929 A (WING F. LO), 24 November 1992 (24.11.92), abstract -- -----	1-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

01/04/96

PCT/SE 96/00299

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9410767	11/05/94	NONE	
GB-A- 2281470	01/03/95	CN-A- 1104402 FR-A- 2705181	28/06/95 18/11/94
US-A- 5166929	24/11/92	CA-A- 2043705 EP-A,A,A 0462572	19/12/91 27/12/91

From the INTERNATIONAL BUREAU

PCT

**NOTIFICATION OF THE RECORDING
 OF A CHANGE**

(PCT Rule 92bis.1 and
 Administrative Instructions, Section 422)

To:

WILLOQUIST, Bo
 Willquist & Partners
 Patentbyrå AB
 S:t Larsgatan 23
 S-582 24 Linköping
 SUEDE

Date of mailing (day/month/year)	21 October 1996 (21.10.96)
Applicant's or agent's file reference 819/1030	IMPORTANT NOTIFICATION
International application No. PCT/SE96/00299	International filing date (day/month/year) 07 March 1996 (07.03.96)

1. The following indications appeared on record concerning:

☐ the applicant ☐ the inventor ☒ the agent ☐ the common representative

Name and Address

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 Albiñ Willquist AB
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 SWEDEN

State of Nationality | State of Residence

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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☒ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address

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 Willquist & Partners Patentbyrå AB
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State of Nationality | State of Residence

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3. Further observations, if necessary: The new name of the agent on the demand (Form PCT/IPEA/401) has been considered by the International Bureau as a request for recording a change in the address of the agent under Rule 92^{bis}. In case of disagreement, the applicant should immediately notify the International Bureau accordingly.

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☒ the International Preliminary Examining Authority ☐ other:

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Facsimile No. (41-22) 740.14.35

Telephone No. (41-22) 730.91.11



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 7/38	A1	(11) International Publication Number: WO 96/31077 (43) International Publication Date: 3 October 1996 (03.10.96)		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> (21) International Application Number: PCT/SE96/00299 (22) International Filing Date: 7 March 1996 (07.03.96) (30) Priority Data: 9501177-1 31 March 1995 (31.03.95) SE (71) Applicant (for all designated States except US): TELEFON- AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): <u>TURINA</u>, Dalibor [SE/SE]; Reduttvägen 14D, S-183 67 Täby (SE). <u>BILL- STRÖM</u>, Lars [SE/SE]; Wiboms väg 25, S-171 60 Solna (SE). (74) Agents: WILLQUIST, Bo et al.; Albiñ Willquist AB, S:t Larsgatan 23, S-582 24 Linköping (SE). </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> (81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i> </td> </tr> </table>			(21) International Application Number: PCT/SE96/00299 (22) International Filing Date: 7 March 1996 (07.03.96) (30) Priority Data: 9501177-1 31 March 1995 (31.03.95) SE (71) Applicant (for all designated States except US): TELEFON- AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): <u>TURINA</u> , Dalibor [SE/SE]; Reduttvägen 14D, S-183 67 Täby (SE). <u>BILL- STRÖM</u> , Lars [SE/SE]; Wiboms väg 25, S-171 60 Solna (SE). (74) Agents: WILLQUIST, Bo et al.; Albiñ Willquist AB, S:t Larsgatan 23, S-582 24 Linköping (SE).	(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>
(21) International Application Number: PCT/SE96/00299 (22) International Filing Date: 7 March 1996 (07.03.96) (30) Priority Data: 9501177-1 31 March 1995 (31.03.95) SE (71) Applicant (for all designated States except US): TELEFON- AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): <u>TURINA</u> , Dalibor [SE/SE]; Reduttvägen 14D, S-183 67 Täby (SE). <u>BILL- STRÖM</u> , Lars [SE/SE]; Wiboms väg 25, S-171 60 Solna (SE). (74) Agents: WILLQUIST, Bo et al.; Albiñ Willquist AB, S:t Larsgatan 23, S-582 24 Linköping (SE).	(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>			
(54) Title: METHOD AND ARRANGEMENT IN A RADIO COMMUNICATION SYSTEM				
(57) Abstract <p>The present invention concerns a process in a radio communication system which is arranged for packet data transmission according to a message-synchronized ALOHA protocol with reservation. Mobile stations in the system are arranged to send access requests to a base station during a reservation phase in a mobile radio system which uses this protocol. The base station is arranged to receive and comply with the access request from a first mobile station by sending thereto a channel reservation message (2) comprising a channel reservation (3). The base station is further arranged to receive access requests from at least a second mobile station for which channel reservation momentarily cannot be carried out. According to the process of the invention an access request received from the second mobile station is confirmed when channel reservation cannot be carried out in the usual manner. The confirmation is sent in the form of an access confirmation (4, 5) which is included in the same channel reservation message (2) as the channel reservation (3) for the first mobile station.</p>				

Method and arrangement in a radio communication system

TECHNICAL BACKGROUND

The present invention concerns a process for a radio communication system which is arranged for packet data transmission according to a message-synchronized ALOHA protocol with reservation. The invention concerns a process for requesting access in a momentarily overloaded mobile radio system, wherein an access request received in a base station from each station in a first group of mobile stations cannot be responded to by channel reservation for the first group of mobile stations.

The invention also concerns a base station and a mobile station in a radio communication system for packet data transmission.

PRIOR ART

In the case of mobile radio communication systems for packet data transmission a base station can communicate with a plurality of mobile stations via one or a plurality of time-divided channels between the base station and the mobile stations. A time-divided channel is divided into time slots. A data burst with a number of information bits can be transmitted in each time slot. The mobile stations do not communicate continuously with the base station and a plurality of mobile stations can therefore compete for the same time-divided channel. Channels are allocated dynamically, separately from the channel requirement of the mobile stations and channel allocation is controlled by the base station.

A mobile station announces a channel requirement by sending an access request to the base station. This access request is sent in a reservation phase in the time-divided channel for transmission from the mobile stations to the base station. Different types of protocol can be used in order to control the access request and channel allocation. A conventional protocol in the case of dynamic allocation of time-divided radio channels is a message-synchronized ALOHA protocol with reservation. In the case of this protocol, each packet transmission is preceded by a reservation. A short message with a request for channel reservation is sent at random from a mobile station to a base station. According to the ALOHA reservation protocol, the result of this access request is fed back by the base station giving the mobile station access

to at least part of the time-divided channel.

Since many mobile stations may have a need of packet data transmission, collisions can occur as a result of a number of mobile stations sending access requests simultaneously. This means that, of the messages sent simultaneously, in the best case the base station can accept one message (by using the so-called "capture" effect). In the case of a collision, the sending mobile stations which do not receive channel reservation have to repeat their access requests. In order to reduce the risk of a further collision, the repeated transmission occurs after a given time interval which varies for each mobile station. It is well known that this time interval can vary randomly for each mobile station.

When all the free channel capacity in a radio communication system has been reserved for communication, overloading occurs if a further mobile station sends an access request to the base station. The latter receives the access request in itself from the mobile station but cannot comply with this request within a given predetermined time interval since there is no free channel capacity. The mobile station is then forced to repeat the access request in the same way as in the case of a collision, when the predetermined time interval has elapsed. This naturally leads to unnecessary extra channel loading, unnecessary delays in the mobile system and the risk of collisions occurring when transmissions are repeated.

US-A-5 166 929, for example, earlier disclosed a multiple-access protocol, in the case of which feedback concerning the status of an access channel is provided from the base station to the mobile stations. The mobile stations can thereby receive information concerning the result of an access request, for example, that a collision has occurred, and whether the next time slot is open for the sending of new access requests. This information makes it easier to determine when a new access request should be sent. A disadvantage of this protocol is that an overload situation is unmanageable. An access request received in the base station has to be repeated in a situation in which channels temporarily cannot be allocated in the base station owing to overloading, i.e. no channels are free.

A paper entitled "Medium Access Priority" by Motorola and presented at the standardizing meeting within ETSI STC SMG2 in Edinburgh on 7 March 1995 discusses a possible need of acceptance confirmation in the case of access requests from a mobile station to a base station. According to this paper, the mobile station is thus to be informed whether the access request has been correctly accepted in the base station. However, it is not mentioned as to how this confirmation of the access request is to be carried out.

DESCRIPTION OF THE INVENTION

The object of the present invention is to propose a process in a radio communication system for packet data transmission. The invention achieves this object by managing the access request from each station in a first group of mobile stations to a base station in a momentarily overloaded radio communication system which lacks free channel capacity for data transmission.

The object is achieved by the use of a message-synchronized ALOHA protocol with reservation. Packet data transmission is carried out via one or a plurality of time-divided channels between a base station and mobile stations. The mobile stations are arranged so as to send the access request to the base station during a reservation phase in a mobile radio system which uses this protocol. The base station is arranged so as to accept and comply with the access request from a first mobile station by sending thereto a channel reservation message comprising a channel reservation. As a result of this channel reservation, time slots for packet data transmission from the first mobile station to the base station are reserved. The base station is further arranged to accept access requests from a first group of mobile stations for which channel reservation momentarily cannot be carried out. In accordance with the process according to the invention, receipt of the access request from the first group of mobile stations is confirmed when the channel reservation cannot be carried out in the usual manner. Confirmation is sent in the form of access confirmations which are included in the same channel reservation message as said channel reservation for the first mobile station. The channel reservation message is received by each of the mobile stations in the first group. The mobile stations are actuated so that they await channel reservation without making repeated access requests. In connection with the

access confirmations, a queue of the mobile stations in the first group is arranged in the mobile radio system. Channel reservation for the mobile stations in the first group is carried out according to their position in this queue.

- 5 The invention also concerns a base station and a mobile station in a radio communication system for packet data transmission. The base station and mobile station according to the invention are arranged to implement the process according to the invention.
- 10 By means of the process according to the invention the load on an access channel to the base station can be decreased since the number of times which an access request is repeated in the system is reduced. This naturally reduces the average delay in transmission of data between a mobile station and a base station. Furthermore a shorter time interval can be predetermined before the access request is initialized
- 15 again, which means shorter average access delay.

DESCRIPTION OF THE DRAWINGS

- Figure 1 shows a mobile radio system with mobile stations and a base station; and
- 20 Figure 2 shows a channel reservation message from a base station to mobile stations.

PREFERRED EMBODIMENT

- In the following the invention will be explained in greater detail with reference to the drawings, in which Figure 1 shows a cell 1 in a mobile radio communication system with mobile stations MS1 - MS3 and a base station BS, for example a GSM system for communication via time-multiplex channels (TDMA).
- 25

- In the preferred embodiment a single communication channel Ch1 adapted for packet data transmission is used. This means that both data packets and associated control signals are transmitted via the same channel.
- 30

A mobile station MS1 initiates packet data transmission by sending an access request

to a base station BS via a data packet channel. This access request comprises identification of the transmitting mobile station, for example in the form of a random figure, possibly together with information about the desired class of service (for example, priority). The access request is dispatched randomly in order to reduce the risk of access requests from a plurality of mobile stations being sent simultaneously, but the request has to be sent within a given time interval which is reserved for this type of transmission. This time interval can, for example, consist of a time slot in a number of periodically recurring time frames. When the access request has been received and if channel capacity is available for this packet data transmission, the base station BS sends a channel reservation message 2 to the mobile station MS1. This channel reservation message includes a channel reservation whereby time slots for transmitting from the mobile station to the base station are allocated. The channel reservation further includes a reference to the access request which is accepted. The reference includes the same information which was received in the access request and a reference to the time frame or time slot in the time-divided channel Ch1 in which the access request was received. A mobile station MS1 thereby receives information as to whether the channel reservation is intended for this very mobile station. The mobile station MS1, from which the access request originates, thereby receives information that it has been allocated time slots for packet data transmission.

During the time in which the mobile station MS1 carries out packet data transmission on the reserved channel, it is important that the other mobile stations MS2, MS3 do not attempt to initiate transmission on the channel. Access requests from the mobile stations are therefore only permissible when the base station BS reports that one or a plurality of time slots are free for this purpose. The base station indicates that it is possible to send access requests by placing a flag on the channel to the mobile stations MS1 - MS3. When packet data transmission in the allocated time slots has terminated, the base station indicates that a number of time slots in the channel from the mobile stations to the base station are again open for access requests. Access requests can again be sent randomly to the base station.

During the time slots which are free between the transmission of different data packets from mobile stations to the base station, i.e. open for access requests, a

plurality of mobile stations MS1 - MS3 can send an access request to the base station BS. If transmission occurs at the same time for some of the mobile stations MS1 - MS3, a collision occurs between the transmissions. In this collision situation, the base station BS is unable to interpret the message from more than at most one of the stations in question and the transmission of the access request therefore has to be repeated.

If a plurality of mobile stations MS1 - MS3 send access requests without overlapping to a base station, the channel reservation can only be carried out for one or more of these stations. When a channel reservation is carried out for a first mobile station MS1, the other mobile stations MS2, MS3 have to await free channel capacity in spite of the fact that the access requests from these stations have been received correctly in the base station BS. In re-transmission situations access requests can also be received randomly between different transmissions included in a sequence relating to the same data packet. This depends on whether it is desired to use the gaps in such a sequence so that access requests can be received. According to the invention, in order to prevent a new wave of access enquiries from these mobile stations MS2, MS3, each access request correctly received in the base station (up to a given limit) is usually responded to. Access confirmations 4, 5 are accordingly sent to at least a number of the stations MS2, MS3 which do not immediately have a channel reservation 3 accepted. These access confirmations are included in a channel reservation message 2 comprising a channel reservation 3 to the mobile station MS1 which is allocated a channel in response to the access request. Such a channel reservation message 2 is shown in Figure 2. Since this channel reservation 3 is sent in a message 2 in a format which is common to all the control messages, for example comprising four time slots, and since given control data can be used together, a limited number of access confirmations 4, 5 can be included in the same message 2.

These access confirmations consequently do not give rise to increased channel loading.

The confirmation of correctly received access requests from a number of mobile

stations enables a queue of mobile stations awaiting their turn for packet data transmission to be arranged in the mobile radio system.

5 When packet data transmission is used in the GSM system a limited number of access confirmations can be included in a message with channel reservation. As concerns the reference to the time frame when the enquiry from a mobile station was received, this access confirmation is carried out in two ways. The first way is to indicate the number of the time frame (related to a given multiframe structure which is used in the system), in the same way as in the channel reservation 3, in
10 part of the channel reservation message 2. The other way is, instead, to use a reference relating to the time frame which is given in the usual channel reservation message.

15 It will be appreciated that the invention is not restricted to the above-described embodiment but encompasses any embodiment which lies within the scope of protection of the following claims.

CLAIMS

1. Process for a radio communication system which is arranged for packet data transmission via at least one time-divided channel (Ch1) between a base station (BS) and mobile stations (MS1 - MS3), according to a message-synchronized ALOHA protocol with reservation, the mobile stations (MS1 - MS3) being arranged to send
5 access requests to the base station (BS), which is arranged to receive and comply with access requests from at least a first mobile station (MS1) by sending thereto a channel reservation message (2) comprising a channel reservation (3), whereby time slots are reserved for packet data transmission between the first mobile station (MS1) and the base station (BS), and to receive access requests from a first group of mobile
10 stations (MS2, MS3) for which channel reservation momentarily cannot be carried out, **characterized in that:**
- the reception of access requests from the first group of mobile stations (MS2, MS3) is confirmed in the form of an access confirmation (4, 5) from the base station (BS) to each of the mobile stations (MS2, MS3) included in the first group;
 - 15 - these access confirmations (4, 5) are included in the channel reservation message (2) with the channel reservation (3) to the first mobile station (MS1);
 - the first group in the radio communication system associated with the access confirmations are arranged in a queue, a queue position being allocated to each of the mobile stations in this group; and
 - 20 - channel reservation is carried out for the mobile stations according to their queue positions.
2. Process according to Claim 1, **characterized in that:**
- the channel reservation message (2) is read by all the mobile stations from
25 which access requests are received in the base station; and
 - access confirmations (4, 5) included in this channel reservation message (2) are received in the mobile stations (MS2, MS3), whereby the latter are actuated so as to await channel reservation without making repeated access requests.
- 30 3. Process according to either of the preceding claims, **characterized in that:**
- a first reference is supplied in the channel reservation (3) to the first mobile

station, which first reference refers to a first time slot in the time-divided channel (Ch1), in which first time slot the access request from the first mobile station (MS1) was received in the base station (BS); and

- a second reference is supplied in each access confirmation (4, 5), which second reference refers to a second time slot in the time-divided channel (Ch1), in which second time slot access requests were received in the base station (BS) from the respective mobile station (MS2, MS3) for which the access confirmations are intended.

10 4. Process according to claim 3, **characterized in that:**

- the second reference is made up of the number of time slots between the first time slot and the second time slot.

15 5. Process in the case of a base station in a radio communication system which is arranged for packet data transmission, via at least one time-divided channel, between a base station and mobile stations, according to a message-synchronized ALOHA protocol with reservation, comprising the following steps:

- receiving access requests from the mobile stations;
- complying with the access request from at least a first mobile station by sending a channel reservation thereto, whereby time slots are reserved for packet data transmission between the first mobile station and the base station;

20 - giving access confirmations to each mobile station in a first group of mobile stations on receipt of access requests from the first group of mobile stations for which channel reservation momentarily cannot be carried out;

25 - sending these access confirmations in the same message as the channel reservation for the first mobile station;

- arranging, in association with the access confirmations, in the radio communication system a queue of the mobile stations in the first group, a queue position being allocated to each mobile station; and

30 - carrying out channel reservation for the mobile stations according to their queue positions.

6. Base station in a radio communication system, which is arranged for packet data transmission via at least one time-divided channel (Ch1) between the base

station (BS) and mobile stations (MS1 - MS3), according to a message-synchronized ALOHA protocol with reservation, the mobile stations (MS1 - MS3) being arranged to send access requests to the base station (BS), which is arranged to receive and comply with access requests from at least a first mobile station (MS1) by sending thereto a channel reservation message (2) comprising a channel reservation (3), whereby a number of time slots are reserved for packet data transmission between the first mobile station (MS1) and the base station (BS), and to receive access requests from a first group of mobile stations (MS2, MS3) for which channel reservation momentarily cannot be carried out, **characterized in that:**

- 10 - the base station (BS) is arranged to give access confirmations (4, 5) to each of the mobile stations (MS2, MS3) which are included in the first group and from which access requests have been received;
- the base station (BS) is arranged to include these access confirmations in the same channel reservation message (2) as said channel reservation (3) for the first mobile station (MS1);
- 15 - the base station (BS) is adapted to arrange a queue of the mobile stations (MS2, MS3) in the first group, a queue position being allocated to each mobile station; and
- the base station is arranged to carry out channel reservation for the mobile stations in the first group according to their queue positions.

7. Mobile station in a radio communication system, which is arranged for packet data transmission via at least one time-divided channel (Ch1) between the base station (BS) and mobile stations (MS1 - MS3), according to a message-synchronized ALOHA protocol with reservation, the mobile stations being arranged to send access requests to the base station, which is arranged to receive and comply with access requests from at least a first mobile station (MS1) by sending thereto a channel reservation message (2) comprising a channel reservation (3), whereby time slots are reserved for packet data transmission between the first mobile station (MS1) and the base station (BS), and to receive the access requests from at least a second mobile station (MS2) for which channel reservation temporarily cannot be carried out, **characterized in that:**

- a mobile station (MS2) which has sent the access request to the base station

is arranged to read each channel reservation message (2) in the time-divided channel (Ch1); and

- the mobile station (MS2) which has sent the access request to the base station (BS) is arranged to receive an access confirmation (4) in this channel reservation message (2) when the channel reservation (3) does not concern this mobile station (MS2), whereupon the mobile station (MS2) is actuated to await channel reservation without further access requests being sent.

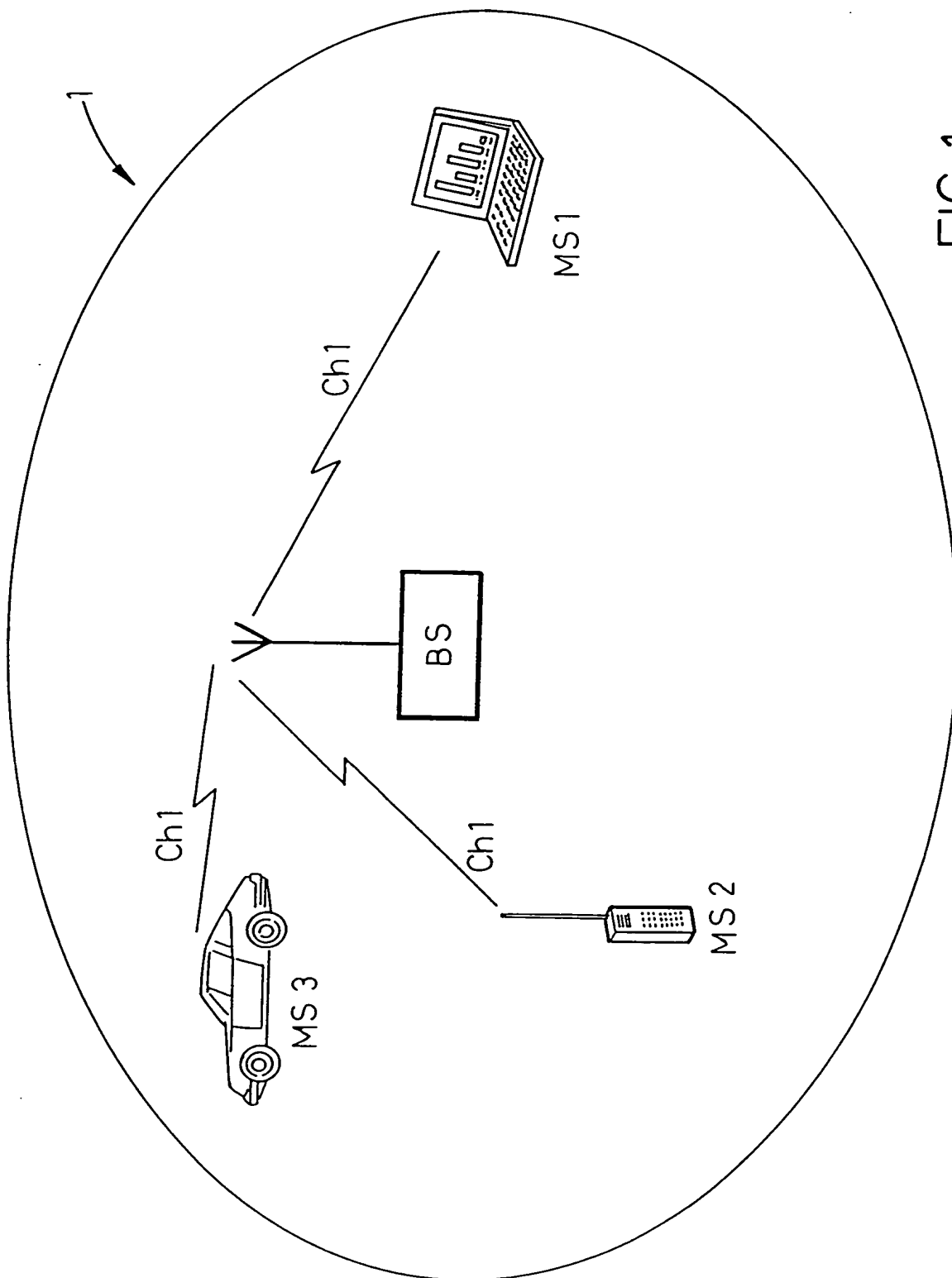


FIG. 1

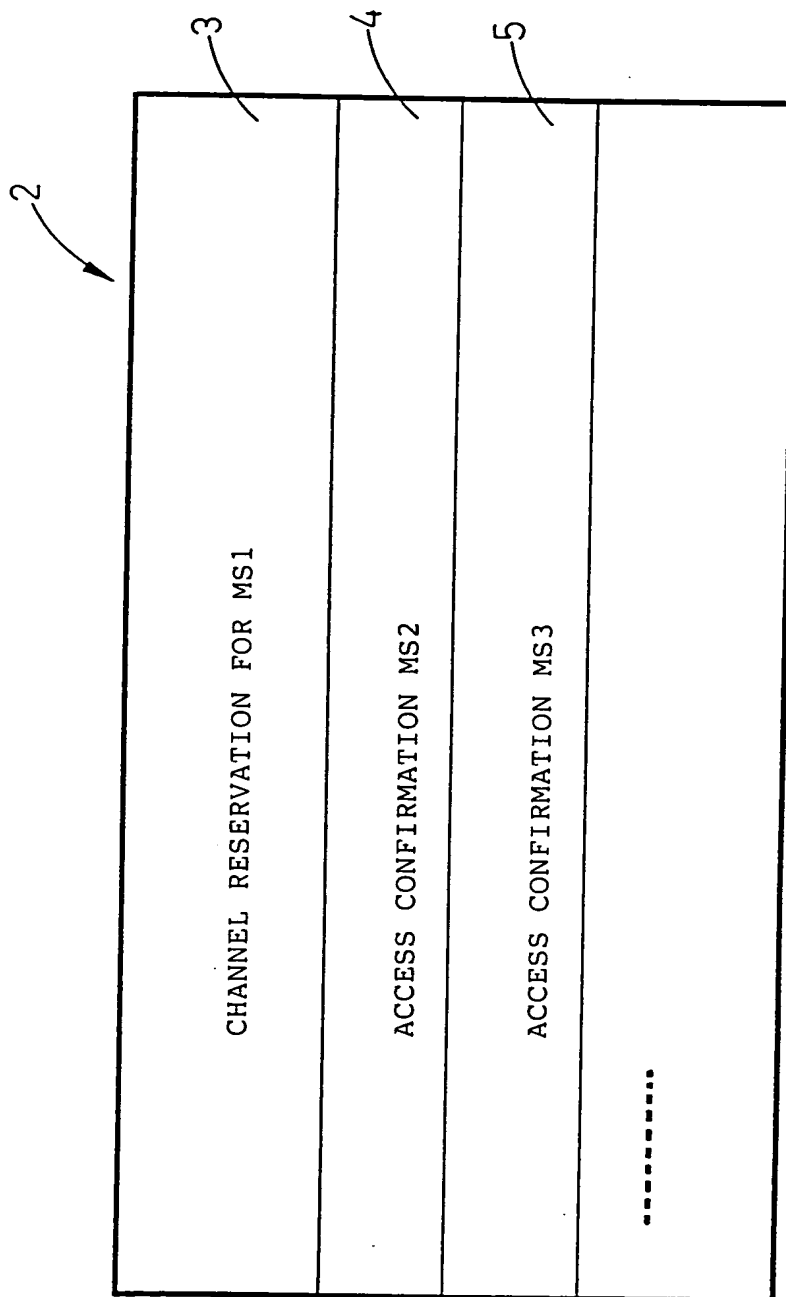


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00299

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9410767 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 11 May 1994 (11.05.94), page 6, line 25 - page 7, line 27, abstract --	1-7
A	GB 2281470 A (MOTOROLA LIMITED), 1 March 1995 (01.03.95), abstract --	1-7
A	Patent Abstracts of Japan, Vol 17, No 434, E-1412, abstract of JP, A, 50-91009 (NIPPON TELEGR & TELEPH CORP), 9 April 1993 (09.04.93), see abstract --	1-7

☒ Further documents are listed in the continuation of Box C.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5166929 A (WING F. LO), 24 November 1992 (24.11.92), abstract</p> <p style="text-align: center;">-- -----</p>	1-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9410767	11/05/94	NONE	
GB-A- 2281470	01/03/95	CN-A- 1104402 FR-A- 2705181	28/06/95 18/11/94
US-A- 5166929	24/11/92	CA-A- 2043705 EP-A, A, A 0462572	19/12/91 27/12/91